# Midterm Exam Answers: Economics 101

### *May 8, 1997 © David K. Levine*

### *1. Short Answers*

a)

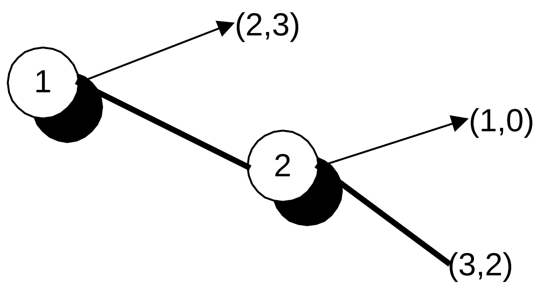
| | L | R |
|---|---|---|
| U | 2*,3*(efficient) | 0,0 |
| D | 0,0 | 1*,2* |

b)

| | L | R |
|---|---|---|
| U | 4,3 | 1,4* |
| D | 5*,0 | 2*,1*(not efficient) |

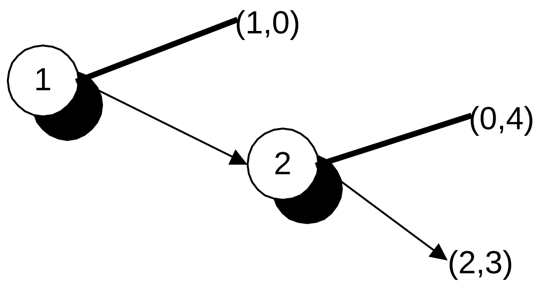
For each of the extensive form games below, find all of the subgame perfect equilibria

c)




equilibrium (3,2) is efficient

d)




equilibrium of 1,0 is not efficient

## 2. Duopoly

Let Macrosoft be firm 1, and Peach firm 2.

a) profits for Macrosoft $\pi_1 = (16 - x_1 - x_2)x_1$, reaction function for Macrosoft from $16 - 2x_1 - x_2 = 0$ is $x_1 = 8 - x_2/2$.

Profits for Peach $\pi_2 = (14 - x_1 - x_2)x_2$, reaction function for Peach from $14 - x_1 - 2x_2 = 0$ is $x_2 = 7 - x_1/2$

Solving the two reaction schedules

$$7 - x_1/2 = 16 - 2x_1$$
$$3x_1/2 = 9, x_1 = 6$$

and solving for $x_2 = 4$, industry output is 10 and price 7

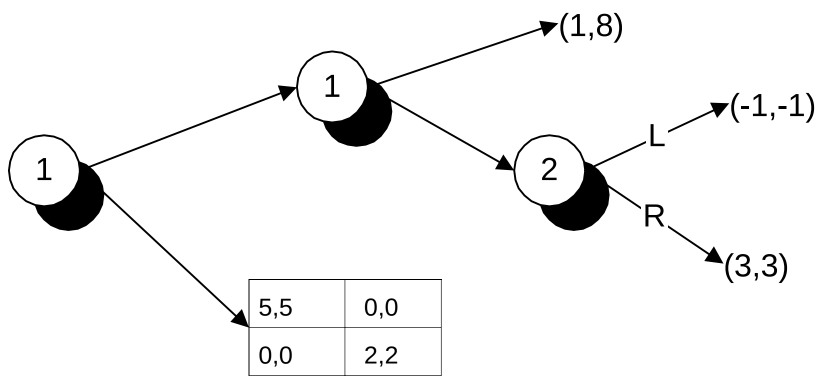
profits are $\pi_1 = 36, \pi_2 = 16$

b) in Bertrand, Macrosoft has the whole market at a price of 4. Output is 14, and Macrosoft profits are 28. Peach produces nothing and has no profits.

c) In Stackelberg with Macrosoft as leader, Macrosoft chooses both $x_1, x_2$ to maximize profits $\pi_1 = (16 - x_1 - x_2)x_1$ subject to Peach's reaction function $x_2 = 7 - x_1/2$ as a constraint. Substitute into profit to find $\pi_1 = (16 - x_1 - (7 - x_1/2))x_1 = (9 - x_1/2)x_1$. Differentiate to find $9 - x_1 = 0$. So output by Macrosoft is 9, output by Peach is 2 ½ , industry output is 11 ½, price is 5 ½, Macrosoft profit is 40.5 and Peach ouput is 6.25.

***3. Cooperation or Competition?***

a)




b)c)

| | LL | LR | RL | RR |
|---|---|---|---|---|
| Uu | 1,8* | 1,8* | 1,8* | 1,8* |
| Ud | -1,-1 | -1,-1 | 3,3* | 3*,3* |
| Du | 5*,5* | 0,0 | 5*,5* | 0,0 |
| Dd | 0,0 | 2*,2* | 0,0 | 2,2* |

d) Ud,RR;  Du,LL; Du,RL and Dd,LR are the Nash equilibria with corresponding payoffs 3,3; 5,5; 5,5; 2,2 e) Subgame perfection requires 2 to play R in the top game, and this means that 1 cannot play Uu. So Ud,RR and Du,RL are subgame perfect, with corresponding payoffs 3,3 and 5,5.

e) Du,LL; Du,RL both Pareto dominate Ud,RR which pareto dominates Dd,LR.

f) RL weakly dominates LL and RR weakly dominates LR

| | RL | RR |
|---|---|---|
| Uu | 1,8* | 1,8* |
| Ud | 3,3* | 3*,3* |
| Du | 5*,5* | 0,0 |
| Dd | 0,0 | 2,2* |

In the reduced game, Ud weakly dominates Uu and Dd

| | RL | RR |
|---|---|---|
| Ud | 3,3* | 3*,3* |
| Du | 5*,5* | 0,0 |

In this game, RL weakly dominates RR

| | RL |
|---|---|
| Ud | 3,3* |
| Du | 5*,5* |

So the unique results of iterated weak dominance is Du,RL with a payoff of 5,5